

## Chemical-Mechanical Planarization Using Ozone

Robert Small

Xiaowei Shang

### ABSTRACT

- 5        The present invention relates to the use of ozone ( $O_3$ ) as a reagent in chemical mechanical planarization either in aqueous solution or as a gas directly impinging on the surface to be planarized. An aqueous solution containing ozone may optionally contain abrasive particles and/or additional CMP reagents co-dissolved with the ozone including carbonate and bicarbonate anions, and organic acids such as formic, oxalic, acetic and glycol. Abrasives that may be added include alumina, silica, spinel, ceria, zirconia.
- 10        Typical concentrations of ozone aqueous solution are in the range from approximately 1 part-per-million up to saturation. Ammonium salts, particularly ammonium carbonate facilitate planarization in cooperation with ozone-containing aqueous solution. Low k dielectric materials, organic as well as inorganic, and difficult to oxidize metals can be
- 15        planarized with ozone reagents pursuant to the present invention.